A Multi-Layered AI-Based Cybersecurity Framework for Real-Time Threat Detection in IoT Systems

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Abstract:

The rapid proliferation of Internet of Things (IoT) technologies has fundamentally transformed modern digital ecosystems by enabling seamless connectivity between devices, systems, and users. Despite its advantages, this expansion has introduced significant cybersecurity challenges due to the heterogeneous nature of IoT devices, limited computational capabilities, and the exponential growth of data. Traditional security mechanisms are often inadequate in addressing dynamic and sophisticated cyber threats in such environments.

This study proposes an AI-based cybersecurity framework for IoT systems that leverages machine learning techniques to enhance threat detection, continuous monitoring, and adaptive response mechanisms. The framework integrates multiple layers, including data acquisition, preprocessing, intelligent analysis, decision-making, and feedback learning. A conceptual research methodology is adopted to design and justify the framework based on recent advancements in artificial intelligence and cybersecurity.

The proposed model aims to improve detection accuracy, reduce response time, and enhance overall system resilience. The findings suggest that integrating AI into IoT security architectures provides a proactive and scalable solution capable of addressing emerging cyber threats in complex environments.